CAIT
Center for Advanced Infrastructure & Transportation
Rutgers, The State University of New Jersey

QUARTERLY PROGRESS REPORT

Project Title:	The Use of Recycled Concrete Aggregate in a Dense Graded Aggregate Base Course
RFP NUMBER: 2007-15	NJDOT RESEARCH PROJECT MANAGER: NJDOT Project Manager
TASK ORDER NUMBER: TO 198 / RU Acct 4-22773	PRINCIPAL INVESTIGATOR: Mr. Thomas Bennert/Dr. Ali Maher
Project Starting Date: 01/01/2007 **Original** Project Ending Date: 12/31/2007 **Modified Completion Date:**	Period Covered: 1st Quarter 2007

Task #	Task	% of Total	Fixed Budget	% of Task this quarter	Cost this quarter	% of Task to date	Total cost to date
1	Mobilization	14.49%	$ 30,000.00	100.00%	$ 30,000	100.00%	$ 30,000
2	Literature Search and National Surveys	13.28%	$ 27,500.00	15.00%	$ 4,125	15.00%	$ 4,125
3	Acquire RCA and Baseline Testing	6.04%	$ 12,500.00	15.00%	$ 1,875	15.00%	$ 1,875
4	Testing of RCA Blends	24.15%	$ 50,000.00	0.00%	$ -	0.00%	$ -
5	NJDOT Draft RCA Specifications	1.46%	$ 3,032.00	0.00%	$ -	0.00%	$ -
6	TDR Evaluation	31.40%	$ 65,000.00	0.00%	$ -	0.00%	$ -
7	Final Report and Quarterly Reporting	9.18%	$ 18,998.00	0.00%	$ -	0.00%	$ -
8		0.00%	$ -	0.00%	$ -	0.00%	$ -
9		0.00%	$ -	0.00%	$ -	0.00%	$ -
10		0.00%	$ -	0.00%	$ -	0.00%	$ -
11		0.00%	$ -	0.00%	$ -	0.00%	$ -
12		0.00%	$ -	0.00%	$ -	0.00%	$ -
13		0.00%	$ -	0.00%	$ -	0.00%	$ -
14		0.00%	$ -	0.00%	$ -	0.00%	$ -
15		0.00%	$ -	0.00%	$ -	0.00%	$ -
16		0.00%	$ -	0.00%	$ -	0.00%	$ -
17		0.00%	$ -	0.00%	$ -	0.00%	$ -
18		0.00%	$ -	0.00%	$ -	0.00%	$ -
19		0.00%	$ -	0.00%	$ -	0.00%	$ -
20		0.00%	$ -	0.00%	$ -	0.00%	$ -
	TOTAL	100.00%	$ 207,030		$ 36,000		$ 36,000

Blue text is entered once at the beginning of the project

Green text is updated ever quarter

Black text is automatically updated or static

Project Objectives:

There are two main objectives of the study: 1) Evaluate recycled concrete aggregate (RCA) from the three (3) regions of the state and determine their respective permeability and stability properties. Once the baseline permeability properties have been established, determine if it is possible to increase the permeability values to that of typically used DGABC. And 2) Evaluate the use of Time Domain

Reflectometry (TDR) as a non-nuclear means of quality control/quality acceptance during field compaction of unbound materials.

Project Abstract:

The New Jersey Department of Transportation (NJDOT) has been using recycled concrete aggregate (RCA) as a base course material since the mid 1980's. Experience has shown that when properly placed, RCA achieves excellent bearing strength and support for the overlying pavement layers. However, recent research conducted by Rutgers University has shown that the permeability properties of RCA are very poor, approximately 0.0 to 0.3 ft/day compared to 125 to 170 ft/day of typical dense graded aggregate based course (DGABC). This has raised concerns in the NJDOT that many of the pavements containing RCA may lack proper drainage and cause pre-mature failure of the pavement system. Fortunately, to date there has not been any recorded pavement failures in New Jersey due to the potential poor drainage of RCA. Regardless, if a pavement failure is possible due to the lack of drainage in the RCA base course layer, the NJDOT would like to evaluate ways of increasing its permeability while maintaining the structural benefits of the RCA.

Over the past few years, the NJDOT has also been examining the use of non-nuclear devices for quality assurance/quality control (QA/QC) of earthwork compaction. One particular unit the NJDOT would like to evaluate further is Time Domain Reflectometry (TDR). The use of TDR was originally developed in the 1930's to locate breaks in coaxial cables, but it wasn't until the 1980's that geotechnical engineers/soil scientists start using the device to determine volumetric water content of soils. TDR research advanced even further to the current test procedure, ASTM D6780, "Water Content and Density of Soil in Place by Time Domain Reflectometry (TDR)", now used to provide both water content and dry density measurements of compacted soils. Due to NJDOT's pursuit for non-nuclear means of compaction control, the NJDOT would like to further evaluate the use of TDR under ASTM D6780 for compaction control of base course aggregate materials.

1. Progress this quarter by task:

At the time of this report, CAIT had just been issued the signed task order agreement and was allowed to start incurring costs. Although this has not been a lot of time, the following tasks have begun to be worked on:

1a. Initial testing of RCA from the three (3) NJDOT regions for baseline values – Testing began on the RCA sampled from Trap Rock Industries in Kingston, NJ, which was selected as the Central NJ source. At the time of the report, the following tests were completed; 1) Washed gradation, 2) Liquid Limit/Plastic Limit/Plasticity Index, and 3) Moisture-Density Relationship.

1b. Initial Development of Survey for State Agencies – A survey is being developed for other state agencies to see how other states were handling RCA and if they had witnessed any issues with its use. The survey will also ask for information regarding permeability properties of their pavements and if any recent pavement failures have been the result of poor drainage. It is anticipated that a proposed survey will be completed by the quarterly report for initial review.

1c. Purchasing of TDR Equipment – a purchase order was developed for the purchase of two (2) TDR systems for evaluation. Both systems were proposed by the manufacturer to be delivered with the next three weeks.

2. Proposed activities for next quarter by task:

2a. Obtaining RCA from other Regions and Complete Baseline Testing – RCA from the other 2 regions will be collected and tested for baseline properties. Once completed, "modification" of the RCA will be conducted in an effort to increase its permeability characteristics while not sacrificing its stability properties.

2b. Initial Testing with TDR Equipment – After delivery of the TDR equipment, testing will quickly begin. The initial testing will be conducted at the Rutgers Asphalt Pavement Laboratory (RAPL) on some typical aggregate/sand sources. After some experience, Rutgers will invite members of the NJDOT Materials Bureau for a demonstration of the equipment. It is hopeful that at this meeting, discussions will take place as to where the field test sections will be selected.

3. List of deliverables provided in this quarter by task (product date):
NA

4. Progress on Implementation and Training Activities:
NA

5. Problems/Proposed Solutions:
NA

Total Project Budget	$207,030
Modified Contract Amount:	
Total Project Expenditure to date	$36,000
% of Total Project Budget Expended	17.39%

NJDOT Research Project Manager Concurrence: _____ Date: _____